

WHAT IS CLAIMED IS:

1: A transmission apparatus having a function to switch a line with a redundant configuration comprising a working line and a protection line from said working line to said protection line in the event of a transmission-line failure on said working line, said transmission apparatus comprising:

a cross-connect-classifying means for inputting cross-connect information from an external source and classifying said information into cross-connect categories wherein said cross-connect information includes a signal direction and information requesting a station employing said transmission apparatus to carry out one of the following pieces of processing:

addition of a signal to either said working line or said protection line;

addition of a signal to both said working line and said protection line;

dropping of a signal from either said working line or said protection line;

dropping of a signal from both said working line and said protection line;

passing-through of a signal; and

dropping of a signal from either said working line

or said protection line and then relaying said signal to either said working line or said protection line;

a communication means for gathering the cross-connect category of each signal-adding or signal-dropping transmission apparatus of a channel and node information identifying said signal-adding or signal-dropping transmission apparatus by communications with an adjacent transmission apparatus for each channel;

a connection-implementation-classifying means for classifying implementations of connection into appropriate connection categories in accordance with gathered cross-connect categories of other transmission apparatuses and the cross-connect category of said transmission apparatus employed in said station to create a table for executing control to switch a line in the event of a failure for each channel;

a failure-reporting means for transmitting information on a failure including node information of said station in the event of said failure on a transmission line between said station and an adjacent station;

a failure-occurrence-location-identifying means for identifying the location of occurrence of a failure from received information on said failure; and

a switching control means for executing control to switch said line based on a location of occurrence of a failure identified by said failure-occurrence-location-identifying means and said table.

2: A transmission apparatus according to claim 1 wherein said cross-connect-classifying means determines said cross-connect information to pertain to one of cross-connect categories of:

addition of a signal to said working line;
addition of a signal to said protection line;
dropping of a signal from said working line; and
dropping of a signal from said protection line.

3: A transmission apparatus according to claim 1 wherein said communication means comprises:

a first station-determining means for determining that said station is an end station for only adding or dropping a signal, a through station for relaying a signal or an intermediate station for dropping a signal as well as relaying said signal for each channel on the basis of said cross-connect information;

a first transfer means for receiving a cross-connect category and node information, storing said cross-connect category and said node information in a stack and transferring said cross-connect category and

said node information;

a second station-judging means, which is used for forming a judgment as to whether said station is a transmitting station transmitting said cross-connect category first or a receiving station transmitting said cross-connect category last on the basis of the direction of said signal when said station is determined to be said end station;

a first transmission means, which is used for acquiring a transmission right first, transmitting said cross-connect category and said node information of said station to an adjacent station and handing over said transmission right to said adjacent station when said station is judged to be said transmitting station;

a second transfer means, which is used for transferring said transmission right to be handed over to said adjacent station when said station is determined to be said through station;

a second transmission means, which is used for acquiring a transmission right handed over to said station, transmitting said cross-connect category and said node information of said station to an adjacent station and handing over said transmission right to said adjacent station when said station is determined to be

said intermediate station; and

a third transmission means, which is used for acquiring a transmission right handed over to said station and transmitting said cross-connect category as well as said node information of said station to an adjacent station when said station is judged to be said receiving station.

4: A transmission apparatus according to claim 3 wherein said communication means transmits a signal for triggering collection of cross-connect information when said station is determined to be said transmitting station and transmits said cross-connect category upon reception of said triggering signal when said station is determined to be said receiving station.

5: A transmission apparatus according to claim 3 wherein said communication means does not store a received cross-connect category in said stack if said cross-connect category stored in said stack indicates a broadcasting station located between a first station and a last station, which drop said received cross-connect category, but said communication means stores said cross-connect category of said station in said stack over said cross-connect category stored immediately before in said stack if:

said station is determined to be said intermediate station or said receiving station;

said transmission right has been acquired; and

said cross-connect category stored immediately before in said stack indicates a broadcasting station.

6: A transmission apparatus according to claim 3 wherein said connection-implementation-classifying means determines the connection category of an implementation of connection in accordance with a cross-connect category stored in said stack.

7: A transmission apparatus according to claim 4 wherein said connection-implementation-classifying means detects incorrect setting from an order of cross-connect categories are stored in said stack.

8: A transmission apparatus according to claim 7 wherein said connection-implementation-classifying means detects successive drop and add cross-connect categories or successive add and drop cross-connect categories as incorrect setting.

9: A transmission apparatus according to claim 7 wherein said connection-implementation-classifying means detects successive add and add cross-connect categories as incorrect setting.

10: A transmission apparatus according to claim 7

wherein said connection-implementation-classifying means detects successive add, drop, add and drop cross-connect categories or successive drop, add, drop and add cross-connect categories as incorrect setting.

11: A transmission apparatus according to claim 7 wherein, for each channel, said connection-implementation-classifying means creates a squelch table composed of node information of 2 stations and, in the case of a DCP connection of dropping a signal from a line and then relaying said signal to said protection line, said connection-implementation-classifying means sets node information of a station dropping said signal relayed to said protection line in said squelch table.

12: A transmission apparatus according to claim 7 wherein, for each channel, said connection-implementation-classifying means creates a squelch table composed of node information of 2 stations and, in the case of a DTP connection of adding a signal to both said working and protection lines, said connection-implementation-classifying means sets node information of a first station adding said signal to both said working and protection lines and node information of a second station dropping said signal added to said protection line in said squelch table.

13: A transmission apparatus according to claim 1 wherein, for each channel, said connection-implementation-classifying means creates a RIP table including node information of a station adding a signal, dropping a signal or relaying after dropping a signal and path information for an implementation of connection.

14: A transmission apparatus according to claim 13 wherein:

said connection-implementation-classifying means sets node information in said RIP table to represent a first distance in a predetermined direction from said station to a station indicated by said node information;

said failure-occurrence-location-identifying means computes a second distance in said predetermined direction from said station to a station indicated by said node information included in received information on a failure; and

said failure-occurrence-location-identifying means determines a location of occurrence of said failure by comparison of the magnitude of said second distance with the magnitude of said first distance set in said RIP table.

15: A transmission apparatus according to claim 13 wherein said switching control means executes switching

control for an implementation of connection based on path information and node information which are set in said RIP table.

16: A transmission apparatus according to claim 1 wherein, for each channel, said communication means recollects a cross-connect category of another transmission apparatus adding or dropping a signal related to said channel and node information identifying said other transmission apparatus when said cross-connect information is re-input.